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# Quantifying the effects of beam polarisation on charged triple gauge couplings

Charged triple gauge couplings (cTGCs) describe potential deviations from the Standard Model in the coupling of two $W$ bosons to a $Z$ boson or a photon. These couplings may interfere with the extraction of Higgs properties. Future $e^+e^-$ colliders need to measure these cTGCs with high precision to fully exploit the potential of their Higgs program.

Current proposals for $e^+e^-$ colliders vary in many aspects, most notably in their energy, luminosities and beam polarisations. Of those, the energy determines the relevant physics and the luminosity trivially scales the statistical precision.

Beam polarisation refers to the preferred direction of the spin in the beam particles. A dedicated magnet setup can flip the direction of a spin with non-zero polarisation.

Electroweak physics depends on the chirality and therefore the spin of the colliding particles. This flipping of the spin changes the allowed interactions. Both reducible and irreducible backgrounds can be suppressed by choosing the appropriate polarisation combination. The cTGC measurement is performed in the production of W bosons and highly sensitive to this effect.

While the physics changes when flipping the polarisations, the systematic effects remain the same. Beam polarisation may therefore provide a direct handle on systematic uncertainties in any measurement.

This study aims to quantify these effects of that a polarised beam may offer.

An extraction of cTGCs is performed together with a measurement of beam polarisations and 2-fermion parameters on generator level differential distributions. The fit is planned to be extended to include systematic effects that are correlated between the different processes.

A collider with polarised beams may achieve a qualitatively different measurement of cTGCs and other electroweak parameters. The extent to which polarisation may reduce systematics and provide access to electroweak physics needs to be clarified.

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